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ABSTRACT

The present paper employs a behavioral simulation model and data on 4,693 school districts to provide new information about the expenditure effects of the current Elementary and Secondary Education Act Title I program and three major alternatives. The model examines the likely effect of the four options, differing in the choice of targets (low-income versus low-achievement pupils) as well as in the method of allocation (block versus matching grant). The general conclusions are that each program is capable of raising the average level of spending on pupils in the target groups to more than the average level spent on nontarget groups; that there is little difference in the amount of aid or the level of expenditure under the different options; that the grants based on a low-income target appear to be more effective than grants based on a low-achievement target in directing aid to districts with a very large number of low achievers; and that matching grants are more effective per dollar of federal aid in increasing total educational spending. These findings bring into sharp focus the issue of whether compensatory education grants are to be thought of as aid to pupils or to communities. (Author/IRT)

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THE EXPENDITURE EFFECTS OF ALTERNATIVE APPROACHES TO COMPENSATORY EDUCATION

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The Elementary and Secondary Education Act of 1965 introduced a program to provide financial assistance to school districts in relation to their numbers of low-income pupils. In fiscal year 1977, this Title I program provided more than $2.2 billion of aid. There is now substantial debate in the Congress and the administration as well as in education circles about the desirability of changing the block grant system that is currently used by the Title I program.[1] The present paper employs a behavioral simulation model and data on 4,693 school districts to provide new information about the expenditure effects of the current program and three major alternatives.

The first section discusses the alternative options and quantitative questions that our analysis will address. Section II describes the behavioral simulation model, the basic data and the parameter estimates. The results for the alternative option are presented in section III.

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[1]This debate led Congress to mandate a study by the National Institute of Education of the Department of Health, Education and Welfare; the basic issues and background information are discussed in their interim report, Evaluating Compensatory Education, issued December 1976 by the National Institute of Education.

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1. Options and Questions

Under the current rules of the Title I program, each state is entitled to a block grant based on the number of pupils from low-income families and the average per pupil level of school spending in the state.[1] The state then distributes its Title I fund among its school districts in proportion to the number of low-income pupils in each district.[2] The local school districts are required to spend these funds on the eligible pupils in addition to the amount that would otherwise be spent on their education.

The two key features that distinguish the current program from the possible alternatives are thus that (1) the grant is based on the number of low-income pupils and (2) the aid takes the form of a block grant rather than a matching grant. Both features have been the subject of debate and counterproposals.

The major alternative to allocating aid based on the number of pupils with low incomes is to relate aid to the number of students with low educational achievement levels.[3] The most direct approach to such achievement targeting would obviously be to administer a standardized test to all

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[1] Since the aggregate amount to which the states are entitled under the law exceeds the annual appropriation for the Title I program, the entitlements are reduced according to a complex set of rules that protects districts against reductions from previous funding levels, etc.

[2] This distribution involves not only the number of poverty families, but also other AFDC recipients and institutionalized children.

[3] Legislation to do this was introduced in the 93rd Congress.

students and then to distribute funds on the basis of the resulting test scores.[1] I will refer to this as the "measured achievement method" to distinguish it from the "predicted achievement method" that is outlined below. The obvious problem with this method is that it gives school districts an incentive to attain test scores that understate the true ability of their students. If the reward for poor performance is great, the resulting bias in reporting is also likely to be great. Test scores can be depressed by providing poor test conditions, by explaining to students that their school will be rewarded with extra resources if they perform poorly, etc. Since poor performance is easily achieved, the resulting test scores are likely to be without value as a measure of students' true abilities. The measured achievement method should therefore probably be rejected as unworkable.

There is an alternative way to distribute aid on the basis of achievement that avoids these problems.[2] The predicted achievement method also begins by administering a standardized test to all students in the state and calculating the proportion of pupils in each district who score below some specified low level. These low achievement proportions are then related by a multiple regression equation to some of the economic and demographic characteristics of the school districts that

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[1] I ignore the two-tier structure of state and local administrative levels to simplify the discussions.

[2] This method is discussed in more detail in Martin Feldstein, "Distributing Federal Education Aid to Low Achievement Pupils: The Predicted Achievement Method," in M. Guttentag (ed.), Evaluation Studies Review Annual, Vol.2. Beverly Hills: Sage Publications, Inc., 1977.

are collected by the Census of Population. The estimated regression equation is then used to "predict" the low achievement proportion that each district would be "expected" to have on the basis of its population characteristics. Title I funds could then be distributed among the districts according to these predicted low achievement proportions.

The predicted achievement method is thus able to use information on test scores without giving school districts an incentive to report a biased measure. Each school district knows that the aid that it will receive will depend on its population characteristics as reported by the Census. The test scores of its students have only a very small and indirect effect on the amount of aid received (i.e., through the influence that the district's low score proportion would have on the estimated coefficients of the regression equation). With a large number of districts, any single district's performance can have only an imperceptibly small effect on the estimated coefficients and the incentive to distort can safely be ignored.

An earlier study,[1] using data for the school districts in Massachusetts, showed that the predicted achievement method could be implemented in practice. The evidence indicated that low achievement scores were associated with the number of children per family and parental education as well as with family income. Although the regression equations are able to explain only a modest fraction of the interdistrict variation of low achievement proportions, the

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[1] Feldstein, op.cit.

several variables used in the equation do account for substantially more of this variance than can be accounted for by a single variable that relates to the number of children in low-income families.

The present analysis uses the predicted achievement method of allocating funds on the basis of low educational achievement as an alternative to the current low-income basis of allocating funds. The application of this method in the current simulations is described more explicitly in the next section.

In addition to the choice between low income and low achievement as the basis for allocating funds, the design of the Title I program must also choose between a block grant and a matching grant. In analyzing this choice, it is important to bear in mind that the Title I program currently uses a special type of block grant--a "differential add-on grant"--rather than a traditional block grant.[1] Conventional economic analysis emphasizes that matching grants lower the net price to the local jurisdiction of the favored activity while traditional block grants are only a supplement to the income of local residents. Matching grants therefore have a substantially greater effect on local spending than an equal amount of aid provided in the form of a block grant.

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[1]The concept of the "differential add-on grant" is discussed in Martin Feldstein, "The Effect of a Differential Add-On Grant: Title I and Local Education Spending," Harvard Institute of Economic Research Discussion Paper No. 562, 1977.

The distinguishing feature of the block grants provided in the Title I program is the requirement that the local government must spend different amounts on two subgroups of the population. By mandating an observable difference in spending between two actual groups, the differential add-on grant provides a basis for monitoring and enforcement. The current simulation will therefore compare a matching grant with a differential add-on grant. The estimated response to both types of grants is discussed in the next section.

The simulations will thus consider four different aid rules, distinguishing block versus matching grants and income versus achievement targets. The current Title I program corresponds to the income targetted block grant option. The specific parameters of the other three options are selected to make their cost equal to the cost of the current program.

There are a wide variety of questions that might be asked of each of the four options. We will limit our analysis to three basic kinds of questions: First, for each option, what are the amount of Title I aid per pupil and the amount of total spending per pupil that go to different types of communities? Communities will be classified according to the relative number of pupils with low educational achievement. Second, for each option, what are the amount of Title I aid per pupil and the amount of total spending per pupil that go to different types of pupils? Pupils will be classified according to whether they are above or below the poverty line and according to whether they have low

educational achievement or not. Finally, we will examine several summary measures of the relation of spending to income and achievement. More specifically, for each option, we calculate the elasticities of total expenditure per pupil in the district and of Title I grants per pupil with respect to measures of income and of educational achievement.

2. The Simulation Model: Structure, Data and Parameter Estimates

Our analysis uses an econometrically estimated model of the behavior of local communities to simulate the effects of alternative Title I options. This section describes the structure of the model and the data that is used to make it operational.

Although the model is in fact a relatively complex computer program, the structure of the model can be described most simply as a set of four basic equations. The first equation describes the financing rule: i.e., the size of the block grant (a dollar amount per pupil) or the matching rate (a ratio of Title I aid per dollar of local spending) for each school district is specified as a function of certain characteristics of the school district. For example, the Title I grant per pupil might be expressed as an amount that is proportional to the fraction of pupils who come from low-income families; this is the basic structure of the current Title I program. The matching aid based on achievement rule makes the matching rate (rather than the number of dollars of aid) a function of the predicted fraction of pupils who have low achievement scores.[1]

The second equation describes how educational spending in the local community responds to the particular aid rule. If a differential add-on block grant is used, each dollar of aid adds some fraction of a dollar to

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[1] Quite complex rules are possible with the model, including the combination of block grants and matching aid with various ceiling and floors.

local educational spending; the econometric estimation of this fraction is discussed below. Alternatively, if a matching grant is used, the reduction in the net price of educational spending is translated into an increase in educational spending by an estimated price elasticity of demand for educational services; the econometric evidence on which this elasticity is based is discussed below.

The third equation calculates the amount of Title I aid that each community receives. For the block grant, this is the same as the amount calculated by the first equation. In contrast, if a matching grant is used, the amount of Title I aid given to each school district is calculated as the product of the matching aid rate implied by equation one and the local expenditure implied by equation two.

Finally, the model allocates the spending and aid within each district according to the income or education level of the pupils. Unfortunately, there is no econometric evidence on the within district effects of Title I aid. Our simulations assume that the program requires that all funds be spent on the target group and that this requirement is effective. Although the evidence on the effect of the current differential add-on grant provides some indirect support for this view, we regard this as the least satisfactory aspect of the model. It is important, therefore, to bear in mind that the analysis at the level of the community does not depend on the assumption about the intracommunity allocation.

The model is used to simulate the effects of alternative options for a sample of more than 4,500 school districts. These districts are a weighted probability sample of all the school districts in the nation

and can therefore be used to make inferences about all school districts. This set of data, prepared by the National Center for Educational Statistics (NCES) of the U.S. Office of Education, combines detailed survey information on the relevant characteristics of the school districts with demographic and economic information from the 1970 Census of Population. More specifically, the 1970 Elementary-Secondary General Information Survey collected evidence on spending patterns, the receipts from different intergovernmental grant programs and the average daily attendance from a large sample of school districts. At the same time, the NCES produced the School District Data Tape by compiling the 1970 Census Fourth Count Population data for each school district with 300 or more pupils as well as for some smaller districts. The NCES then merged the school survey tape with the corresponding subset of districts in the School Data Tape. The result is a rich national sample of matched data on the economic behavior and population characteristics of the nation's school districts.[1]

To this data we have added the predicted value of the proportion of pupils with low educational achievement in each school district. This predicted proportion of pupils with low achievement is based on six characteristics of the population in the school district: the percent of children in poverty; the percent of families with incomes below $8,000 in 1969; the percent of families with incomes above

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[1]The merged data is described in National Center for Educational Statistics, Users' Manual for Combined SDDT-ELSEGIS III (SDEL3) Data Tapes (undated).

$25,000 in 1969; the percent of the adult population who are high school graduates; the percent of the adult population who have attended college; and the number of children per family. The estimated regression coefficients are based on the experience in 310 Massachusetts school districts with the proportion of low-achievement pupils in each district calculated from the test scores of the individual pupils on McGraw-Hill Comprehensive Test of Basic Skills.[1] This achievement test is scored to produce a national average of 400; for targetting the Title I aid, low achievement was defined as a score of less than 360. On average, 8.7 percent of pupils had predicted scores below this level but school districts varied from a prediction of less than 5 percent of pupils as low scorers to more than 30 percent.[2]

The key behavioral parameters of the model are the effects on local spending of add-on block grants and of matching grants. Although the estimates of these effects are discussed at length elsewhere, a brief summary at this point is appropriate. The effect of a differential add-on grant was estimated with the same data as school district finances

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[1] These regressions and the underlying data are described more fully in Martin Feldstein, "Distributing Federal Education Aid to Low Achievement Pupils: The Predicted Achievement Method."

[2] The average of 8.7 percent is a weighted average of the school district percentages.

and demographic characteristics that are used in the simulation model.[1] The estimates indicated that local school districts increase their spending by a substantial fraction of the funds that they receive through the Title I program. The point estimate for the national sample is that 72 cents of each dollar of Title I funds is used to increase school spending. Although additional analysis suggested that the effectiveness of Title I aid in stimulating local spending may vary among different types of school districts, the estimates support the conclusion that between 50 percent and 100 percent of the local Title I budget is added to local school spending. The simulations use a single national propensity to spend Title I dollars of 0.7.

The effect of matching aid on local educational spending was estimated with data for 105 towns in Massachusetts. The Massachusetts data was selected because Massachusetts has a system of matching grants in which the matching rate varies among the individual towns. The estimates, based on data for the most recent available year, indicated a price elasticity of -0.9.[2] Since the Massachusetts experience was based on spending for all pupils, it may not be appropriate to use the same coefficient for aid restricted to low income or low achievement

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[1]The estimates are discussed in Martin Feldstein, "The Effect of a Differential Add-On Grant: Title I and Local Educational Spending," op.cit.

[2]These estimates are reported in Martin Feldstein and Daniel Frisch, "Local Government Budgeting: An Econometric Comparison of Two Alternative Models", Mimeo 1977. Estimates of the price elasticity when the entire sample (1964/65 to 1973/74) is pooled is -0.75.

pupils. The response for these restricted groups may be lower than the response to general aid if voters are less interested in these target groups. Alternatively, the proportionate response may be greater because spending on the favored group could be financed by a small decrease in the spending on other pupils. The elasticity of 0.9 is used in the simulations.

3. Simulation Results

The simulation compares three alternative options to the actual Title I program. The alternative options were designed to achieve the same level of spending as the Title I program did in 1970, i.e., $25.40 per pupil for all primary and secondary pupils.

Although the Title I program is essentially a block grant program targeted at low-income communities, the allocation formula uses a variety of ceilings, floors and state adjustment factors. None of these modifications is used in simulating the three alternative options. Our results can thus be viewed as a comparison of three "pure" alternatives with the actual Title I program.

The block grant targeted to low educational achievement provided school districts with $ 292 per child whose score was predicted to be below the low-achievement cut-off level of 360.[1] The matching grant with the low-income target provided for federal aid per dollar of local spending equal to 0.27 times the proportion of pupils with low incomes. For example, a district in which 30 percent of pupils were low income would have a matching rate of 0.081. This matching rate implies that each dollar of local spending would buy 1.081 dollars of educational resources; stated equivalently, the price to the local district of educational goods and services is reduced to 92 cents per dollar of

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[1] Since 8.7 percent of pupils were predicted to score below 360, a grant of $ 292 for each such pupil resulted in national spending of $25.40 per pupil.

educational resources. The figure of 0.27 was determined iteratively to make the resulting level of aid equal to $25.40 per pupil. Finally, the matching grant with the low-achievement target was provided for federal aid per dollar of local spending equal to 0.47 times the proportion of pupils with low achievement scores.

The upper half of Table 1 compares the amount of aid received by different types of districts under each of the four options. Consider first the classification of districts according to the percentage of pupils below the poverty line. In the majority of the districts (56.4 percent), less than five percent of the pupils were below the poverty line. These districts receive very little aid per pupil under all four options, ranging only between $4 per pupil when aid takes the form of add-on grants based on low achievement and $7 per pupil with matching aid based on poverty. The add-on grant based on poverty provides approximately the same aid per pupil as the matching grant based on poverty for districts with up to 30 percent of pupils below poverty. For the districts with 30 to 50 percent of the pupils in poverty, the add-on grant provides substantially more aid than the matching grant. Only in the poorest 5 percent of districts is this reversed.

It is quite interesting to contrast this comparison of aid with the comparison of total spending shown in the bottom half of the table. Note first that the parameter estimates imply that matching aid stimulates a higher level of educational spending than an equal amount of aid in the form of add-on grants. The $25 of aid per pupil induces an extra $18 of spending if the aid is given as an add-on grant but $24

TABLE 1

Federal Aid and Educational Spending in School Districts

Classified by Pupil Poverty Status

Percentage of Pupils Below Poverty	Percent of Districts	No Aid	Low Income Target		Low Achievement Target	
			Block	Matching	Block	Matching
			Federal Aid Per Pupil			
0 - 5	56.4	--	$6	$7	$4	$5
5 - 10	14.4	--	$12	$14	$16	$17
10 - 20	10.5	--	$29	$30	$28	$32
20 - 30	5.4	--	$39	$38	$42	$37
30 - 40	2.9	--	$57	$48	$56	$44
40 - 50	1.9	--	$76	$61	$68	$53
50 - 75	3.5	--	$104	$75	$82	$60
75 - 100	5.0	--	$114	$120	$114	$85
All Districts	100.0	--	$25	$25	$25	$25
			Educational Expenditure Per Pupil			
0 - 5	56.4	$838	$841	$844	$841	$842
5 - 10	14.4	$734	$743	$747	$745	$750
10 - 20	10.5	$741	$761	$769	$761	$771
20 - 30	5.4	$590	$617	$626	$619	$625
30 - 40	2.9	$512	$551	$558	$551	$555
40 - 50	1.9	$505	$558	$565	$553	$558
50 - 75	3.5	$474	$547	$551	$532	$537
75 - 100	5.0	$490	$570	$613	$569	$578
All Districts	100.0	$719	$737	$743	$737	$743

of spending when it takes the form of matching aid. Because of this greater general efficacy, educational spending per pupil is greater with matching aid in each type of district. Note that this difference is particularly large in the poorest districts.

A comparison of the grants targeted to low-income pupils with the grants targeted to low-achievement pupils indicates the expected effect but the differences are relatively small. More specifically, there is little difference between the two types of target in the amount of aid per pupil for districts with fewer than 40 percent of their pupils in poverty. However, in the poorest 10 percent of districts, targeting the grants on the basis of low income produces substantially more aid and a significantly higher level of spending.

The results are different and quite surprising when districts are classified according to the proportion of pupils with low educational achievement. The top half of Table 2 shows that there is little difference among the options in the amount of federal aid per pupil in the more than 95 percent of districts in which the predicted percentage of pupils with low educational achievement was less than 20 percent. Among the remaining districts, however, the aid per pupil is actually higher under the income targeted plans than when aid is targeted according to predicted achievement. Poor pupils are so heavily concentrated in districts with a large number of low achievers that allocating funds according to poverty actually focuses a greater proportion of aid on these educationally poorest districts than the system of targeting aid in proportion to the number of low scoring pupils.

TABLE 2

Federal Aid and Educational Spending in School Districts

Classified by Low Achievement Status

Predicted Percentage of Pupils With Low Educational Achievement	Percent of Districts	No Aid	Low Income Target		Low Achievement Target	
			Block	Matching	Block	Matching
			Federal Aid Per Pupil			
0 - 5	33.6	--	$6	$10	$6	$7
5 - 10	34.6	--	19	22	22	25
10 - 20	27.4	--	40	37	39	38
20 - 30	3.9	--	80	60	70	53
30 - 40	0.5	--	128	92	94	71
All Districts	100.0	--	25	25	25	25
		Educational Expenditure Per Pupil				
0 - 5	33.6	$812	$816	$820	$816	$818
5 - 10	34.6	727	740	747	742	750
10 - 20	27.4	663	691	698	690	699
20 - 30	3.9	490	546	550	539	543
30 - 40	0.5	486	575	582	552	561
All Districts	100.0	719	737	743	737	743

The same pattern emerges when we examine educational expenditure per pupil. In the districts with the heaviest concentration of poor pupils, spending is actually greater for the options that target aid according to poverty rates than the options that target according to poor achievement itself.

Any attempt to summarize the results of Tables 1 and 2 by simple statistical measures will fail to convey the complexity of the pattern and, in particular, the difference between the results for the districts with low and moderate proportions of poor or low-achievement pupils and those districts with high proportions of such pupils. Despite this shortcoming, we have calculated a single elasticity to represent each column of figures; these elasticities are presented in Table 3.[1] The elasticity of expenditure per pupil with respect to mean income in the district is 0.48 in the absence of aid and is reduced to approximately 0.40 with any of the four grant options. Similarly, the elasticity of expenditure per pupil with respect to the percent of low achievers is -0.12 with no aid and approximately -0.10 with any of the four grant options.

The elasticities of federal funds per pupil show greater contrasts among the four options. Targeting on low achievement implies a greater (absolute) elasticity with respect to both mean income and the proportion of low achievement pupils. With either target, the block grant has a greater absolute elasticity than matching aid.

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[1]The elasticities are calculated as the regression coefficient in the regression of the logarithm of expenditure or aid on the logarithm of income or of the percent of low achievers. The regression weights observations according to the sampling ratios.

TABLE 3

Elasticity of Total Expenditure and Federal Funds

With Respect to District Income and Predicted Achievement

	Expenditure Per Pupil		Federal Funds Per Pupil	
	Elasticity With Respect to		Elasticity With Respect to	
	Mean Income	Low Achievement*	Mean Income	Low Achievement
No Aid	0.48	-0.12	--	0.76
Low Income Target				
Block	0.40	-0.10	-2.43	0.76
Matching	0.39	-0.10	-2.05	0.65
Low Achievement Target				
Block	0.40	-0.10	-3.25	1.07
Matching	0.38	-0.09	-2.88	0.98

*Low achievement is the predicted proportion of pupils with low achievement.

Our final analysis of the simulations refers to the distribution of aid and of expenditure among pupils rather than school districts. As we noted above, we assume that any within district targeting requirement is 100 percent effective. We consider two such within district methods of allocating funds: targeting to low-income pupils and to low-achievement pupils. In principle there is no reason why funds cannot be distributed among districts on one basis and then distributed within each district on a different basis. The results are shown in Table 4.[1]

It is clear that the simulation implies that the target group enjoys a substantially higher level of expenditure under any of the four types of grants than the level received by those outside the target group. This is true even though, as Tables 1 and 2 demonstrate, poor pupils and those with low achievement tend to live in districts with substantially less than average spending. Moreover, the level of aid per target pupil is very large and clearly represents very great discrepancies within school districts.

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[1] Note that we cannot say anything about the division of aid between low achievers and others when funds are distributed within the district according to poverty status since there is no information on the cross-classification of pupils by poverty status and achievement score.

TABLE 4

Federal Aid and Educational Spending Among Pupils

Classified by Income and Achievement Status

Funds Allocated Within Districts According to:	Funds Allocated Among Districts According to:			
	Low Income Target		Low Achievement Target	
	Block	Matching	Block	Matching
	Federal Aid Per Pupil			
Poverty				
Below	175	175	175	174
Above	0	0	0	0
Achievement				
Low	293	293	293	304
Other	0	0	0	0
	Expenditure Per Pupil			
Poverty				
Below	811	822	812	822
Above	724	729	724	730
Achievement				
Low	929	939	929	938
Other	719	724	719	724

4. Conclusion

The focus of the current study is both methodological and substantive. We have developed a behavioral simulation model of the effect of alternative grant structures on school spending and the distribution of federal aid. The model incorporates an important new body of data on more than 4,500 individual school districts and uses econometric estimates of the impact of differential add-on block grants of the type used in the current Title I program as well as of alternative forms of matching aid. With this model we have examined the likely effects of four specific options, differing in the choice of targets (low-income pupils versus low-achievement pupils) as well as in the method of allocation (block grant versus matching grant). The similarities and differences of these effects are analyzed in section 3 and need not be repeated here. The general conclusions, however, are clear. First, with the current level of funding, the actual Title I program and each of the alternatives that we studied is capable of raising the average level of spending on pupils in the target groups to more than the average level spent on non-target groups. Second, for the great majority of school districts, there is little difference in the amount of aid or the level of expenditure under the four different options. Third, the grants based on a low-income target actually appear to be more effective than grants based on a low-achievement target in directing aid to districts with a very large number of low achievers. Finally, matching grants are more effective per dollar of federal aid in increasing total educational spending.

These findings bring into sharp focus the issue of whether compensatory education grants are to be thought of as aid to pupils or to communities. If their purpose is to aid communities, grants based on low-income can be regarded as most effective in reaching both the communities with the highest proportion of poverty students and the highest proportion of low-achievement students. From this point of view, the only change worth considering is the substitution of matching aid for the current block grants. But although most communities would be largely unaffected by the choice between targeting to low-income pupils and to low-achievement pupils, the choice of target can make a very large difference to the pupils themselves. The appropriate choice of the target, as well as the more basic issue of whether a federal program should intentionally create great disparities in the educational resources enjoyed by similar pupils within a single community, raises complex issues that lie beyond the scope of this paper.